NEC

Silicon Transistor
2SC5338

NPN EPITAXIAL SILICON TRANSISTOR
HIGH FREQUENCY LOW DISTORTION AMPLIFIER

DESCRIPTION

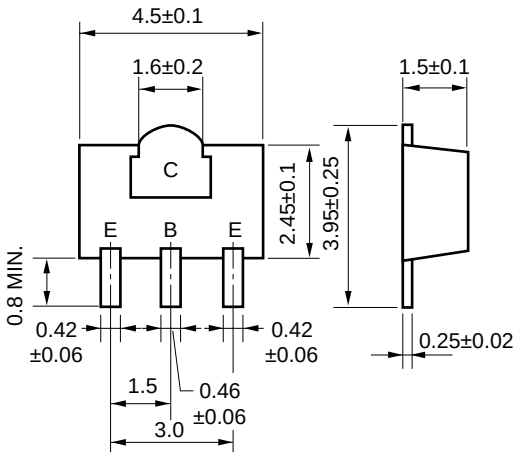
The 2SC5338 is designed for a low distortion and low noise RF amplifier with an operation on the low supply voltage (V_{CE} = 5 V). This low distortion characteristics is suitable for the CATV, tele-communication, and such.

FEATURES

- High gain
  $|S_{21}|^2$ = 10 dB TYP., @V_{CE} = 5 V, Ic = 50 mA, f = 1 GHz
- Low distortion and low voltage
  IM_2 = –55 dB TYP., IM_3 = –76 dB TYP.
  @V_{CE} = 5 V, Ic = 50 mA, V_{in} = 105 dB μV/75 Ω
- New power mini-mold package version of a 4-pin type gain-improved on the 2SC4703

PACKAGE DIMENSIONS

(in millimeters)



PIN CONNECTIONS
E: Emitter
C: Collector
B: Base

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	Rating	Unit
Collector to Base Voltage	V_{CBO}	25	V
Collector to Emitter Voltage	V_{CEO}	12	V
Emitter to Base Voltage	V_{EBO}	2.5	V
Collector Current	I_C	150	mA
Total Power Dissipation	P_T Note1	1.8	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note 1. 0.7 mm × 16 cm^2 double sided ceramic substrate (Copper plaiting)

Document No. P10940EJ1V0DS00 (1st edition)
Date Published April 1996 P
Printed in Japan

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Parameter	Symbol	Test Conditions		MIN.	TYP.	MAX.	Unit
Collector Cutoff Current	I_{CBO}	V_{CB} = 20 V, I_E = 0				1.5	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 2 V, I_C = 0				1.5	μA
DC Current Gain	h_{FE}	V_{CE} = 5 V, I_C = 50 mA[Note2]		50		250	
Gain Bandwidth Product	f_T	V_{CE} = 5 V, I_C = 50 mA			6.0		GHz
Feed-back Capacitance	C_{re}	V_{CB} = 5 V, I_E = 0, f = 1 MHz[Note3]			1.0	2.0	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 5 V, I_C = 50 mA, f = 1 GHz		8.5	10		dB
Nose Figure	NF	V_{CE} = 5 V, I_C = 50 mA, f = 1 GHz				3.5	dB
2nd Order Intermoduration Distortion	IM_2	I_C = 50 mA V_{in} = 105 dB μV/75 Ω f = 190 MHz − 90 MHz	V_{CE} = 5 V		− 55		dB
			V_{CE} = 10 V		− 63		
3rd Order Intermoduration Distortion	IM_3	I_C = 50 mA V_{in} = 105 dB μV/75 Ω f = 2 × 190 MHz − 200 MHz	V_{CE} = 5 V		− 76		dB
			V_{CE} = 10 V		− 83		

Notes 2. Pulse measurement: PW ≤ 350 μS, Duty Cycle ≤ 2 %

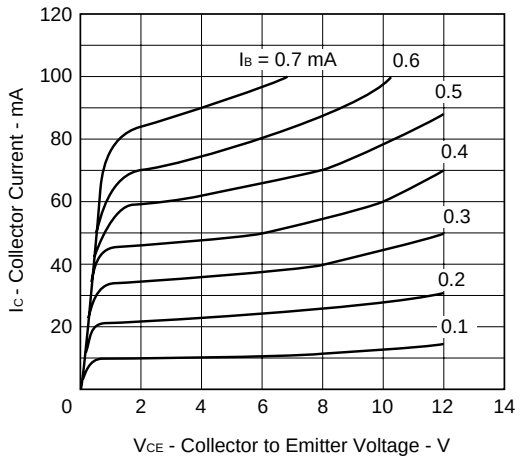
3. Mesured by a 3-terminal bridge. Emitter and Case should be connected to the guard terminal.

h_{FE} Classification

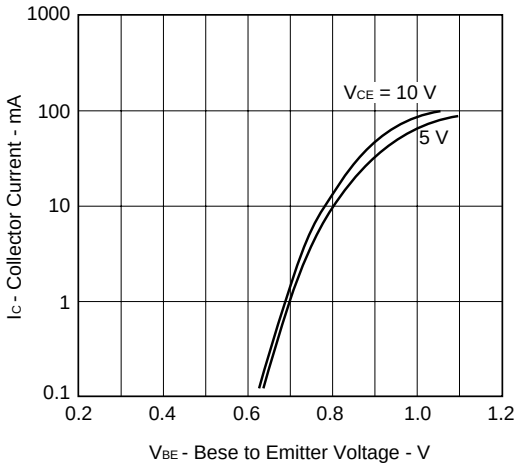
Rank	SH	SF	SE
Marking	SH	SF	SE
h_{FE}	50 to 100	80 to 160	125 to 250

TYPICAL CHARACTERISTICS (T_A = 25 °C)

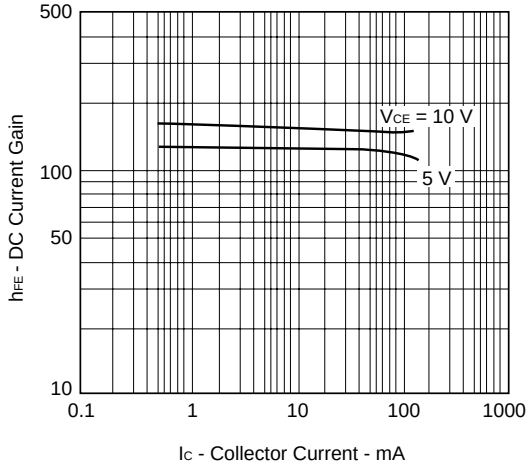
I_C - V_{CE} Characteristics



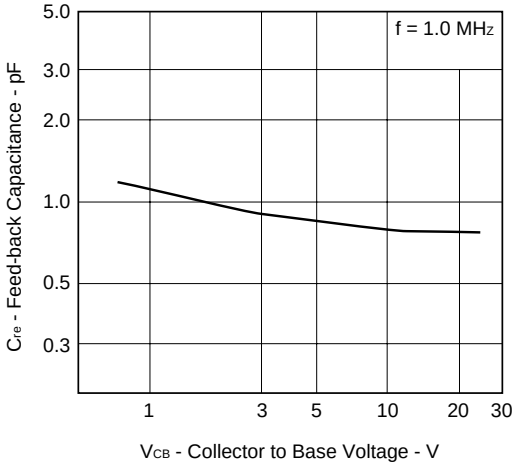
I_C - V_{BE} Characteristics



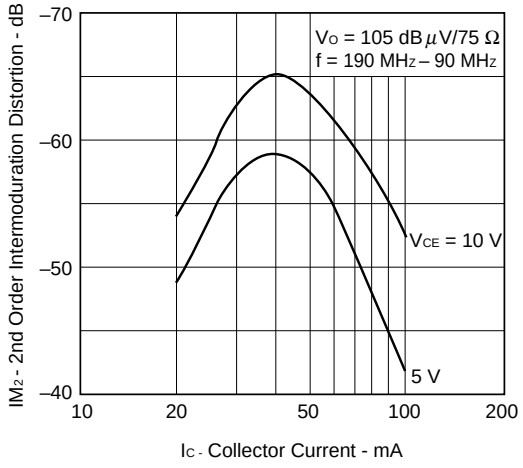
h_{FE} - I_C Characteristics



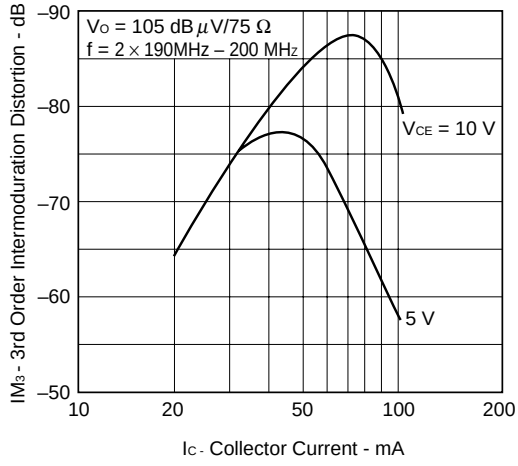
C_{ob} - V_{CB} Characteristics



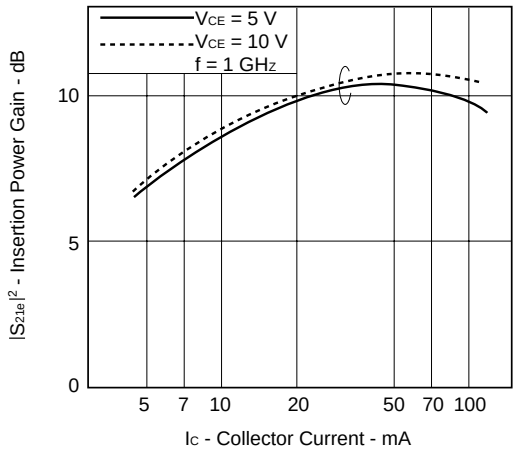
IM_2 - I_C Characteristics



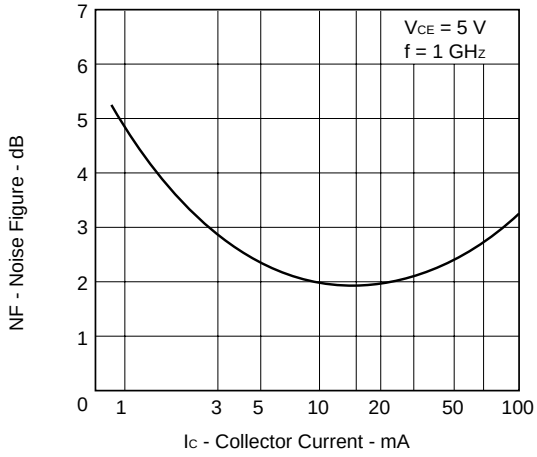
IM_3 - I_C Characteristics



$|S_{21e}|^2$ - I_C Characteristics



NF - I_C Characteristics



S-PARAMETER

V_{CE} = 5 V, I_C = 50 mA

	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.642	– 61.5	19.689	138.5	.026	64.9	.603	– 39.7
200	.521	– 103.0	13.393	116.8	.045	53.1	.461	– 62.1
300	.464	– 123.8	9.708	106.3	.053	57.8	.359	– 72.8
400	.428	– 137.2	7.480	99.5	.059	62.1	.304	– 75.7
500	.408	– 147.7	6.078	94.5	.072	63.7	.289	– 79.4
600	.390	– 154.3	5.104	91.3	.080	65.9	.275	– 83.2
700	.374	– 161.1	4.394	88.6	.088	66.2	.277	– 82.8
800	.360	– 163.9	3.880	86.2	.097	68.9	.261	– 85.0
900	.348	– 168.0	3.527	84.5	.110	72.1	.271	– 81.6
1000	.351	– 175.1	3.224	83.3	.119	72.0	.268	– 79.9
1100	.329	179.8	3.078	81.8	.125	76.4	.276	– 75.5
1200	.328	– 179.9	3.111	78.9	.144	73.7	.321	– 75.3
1300	.319	171.9	2.914	69.6	.157	77.8	.320	– 82.4
1400	.297	168.9	2.501	66.2	.166	75.7	.291	– 83.6
1500	.307	165.2	2.285	65.3	.182	77.7	.325	– 83.4
1600	.308	159.6	2.115	63.9	.192	77.7	.305	– 82.7
1700	.303	156.6	1.993	62.9	.201	77.4	.313	– 81.7
1800	.309	154.1	1.880	62.0	.219	75.5	.327	– 83.5
1900	.312	150.3	1.786	60.8	.222	74.9	.321	– 86.3
2000	.315	148.4	1.704	59.9	.242	75.9	.341	– 91.2

S-PARAMETER

V_{CE} = 5 V, I_C = 100 mA

	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.647	– 73.2	21.091	134.7	.039	58.3	.793	– 45.3
200	.529	– 112.8	13.280	113.6	.060	53.9	.561	– 71.0
300	.480	– 133.5	9.390	103.3	.072	54.2	.409	– 82.3
400	.459	– 146.3	7.213	96.7	.079	55.6	.360	– 86.1
500	.443	– 155.4	5.826	92.0	.090	58.6	.333	– 90.2
600	.424	– 160.9	4.890	89.2	.102	57.6	.315	– 95.6
700	.406	– 166.8	4.206	86.9	.111	61.4	.297	– 96.0
800	.401	– 169.8	3.711	84.3	.120	64.2	.292	– 95.6
900	.396	– 173.9	3.372	82.7	.135	66.9	.288	– 93.9
1000	.391	– 178.9	3.093	81.8	.143	67.0	.294	– 91.3
1100	.361	176.3	2.950	80.4	.157	67.4	.298	– 86.5
1200	.366	175.3	2.984	77.2	.166	67.9	.338	– 86.4
1300	.363	167.7	2.788	67.5	.178	68.5	.359	– 94.6
1400	.337	165.3	2.413	64.6	.192	71.3	.320	– 95.5
1500	.352	160.9	2.194	63.4	.210	70.8	.322	– 96.3
1600	.349	157.0	2.017	61.7	.220	68.8	.314	– 92.3
1700	.352	154.7	1.900	60.9	.236	69.4	.329	– 91.1
1800	.353	152.0	1.810	60.3	.248	69.1	.339	– 93.7
1900	.354	147.9	1.730	58.8	.252	68.8	.336	– 98.1
2000	.354	146.6	1.633	57.8	.261	66.2	.342	– 98.2

S-PARAMETER

V_{CE} = 10 V, I_C = 50 mA

	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.699	– 59.3	21.061	140.1	.037	68.2	.860	– 37.6
200	.540	– 97.0	14.088	118.4	.057	57.8	.629	– 62.0
300	.461	– 119.1	10.216	107.1	.066	55.0	.464	– 72.1
400	.423	– 133.2	7.898	99.9	.076	56.4	.409	– 77.1
500	.403	– 144.4	6.431	95.0	.087	56.6	.375	– 80.6
600	.383	– 150.8	5.407	91.8	.099	58.7	.363	– 86.2
700	.355	– 158.1	4.640	89.3	.110	59.6	.327	– 87.7
800	.338	– 161.3	4.093	86.7	.118	61.4	.323	– 87.8
900	.333	– 165.1	3.723	84.9	.129	63.9	.310	– 86.0
1000	.322	– 172.7	3.406	84.0	.137	66.0	.324	– 83.2
1100	.303	– 177.8	3.245	82.6	.150	65.6	.333	– 79.9
1200	.306	– 178.3	3.278	79.5	.159	66.2	.371	– 80.5
1300	.295	171.3	3.074	69.9	.168	67.6	.377	– 86.5
1400	.276	171.0	2.644	67.0	.180	69.7	.347	– 86.7
1500	.283	164.5	2.397	66.2	.198	70.5	.363	– 88.4
1600	.282	159.5	2.208	64.7	.208	69.1	.342	– 85.6
1700	.283	157.3	2.088	64.1	.220	70.0	.344	– 86.0
1800	.287	154.8	1.986	62.6	.232	70.0	.366	– 87.8
1900	.290	150.4	1.886	61.7	.247	69.4	.371	– 89.3
2000	.300	148.7	1.787	60.7	.254	68.4	.361	– 92.9

S-PARAMETER

V_{CE} = 10 V, I_C = 100 mA

	S_{11}		S_{21}		S_{12}		S_{22}	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.651	– 64.8	21.694	136.2	.029	62.4	.588	– 43.4
200	.520	– 106.4	14.288	114.6	.042	53.0	.435	– 62.7
300	.460	– 126.5	10.214	104.5	.051	56.6	.330	– 73.0
400	.420	– 140.1	7.822	98.1	.061	58.4	.284	– 77.1
500	.395	– 150.0	6.355	93.2	.070	65.6	.270	– 78.8
600	.384	– 156.3	5.314	90.3	.077	67.0	.257	– 82.2
700	.367	– 162.9	4.569	87.8	.089	70.9	.258	– 82.1
800	.350	– 165.5	4.037	85.6	.095	71.6	.241	– 82.9
900	.343	– 169.3	3.649	83.8	.106	72.5	.257	– 79.5
1000	.339	– 177.1	3.353	82.8	.117	73.9	.258	– 79.3
1100	.316	177.9	3.193	81.0	.125	75.0	.261	– 73.6
1200	.315	179.4	3.217	78.4	.142	75.5	.311	– 72.3
1300	.309	170.1	3.026	69.1	.152	78.1	.324	– 80.4
1400	.287	165.6	2.592	65.9	.164	75.6	.280	– 81.0
1500	.303	161.9	2.374	65.2	.173	80.5	.308	– 82.6
1600	.293	157.9	2.179	63.5	.187	78.1	.295	– 81.4
1700	.301	153.7	2.054	62.4	.200	78.2	.307	– 78.7
1800	.303	150.7	1.945	61.4	.214	75.9	.313	– 82.1
1900	.306	148.8	1.840	60.5	.225	75.4	.321	– 82.8
2000	.311	147.2	1.753	59.7	.240	75.0	.332	– 86.9

[MEMO]